



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/558,383

11/07/2006

Masato Yamazaki

Q90710

4172

23373 7590 05/13/2008
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

ROSENAU, DEREK JOHN

ART UNIT

PAPER NUMBER

2834

MAIL DATE

DELIVERY MODE

05/13/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/558,383	Applicant(s) YAMAZAKI ET AL.	
	Examiner Derek J. Rosenau	Art Unit 2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 November 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/29/05 11/7/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements filed 29 November 2005 and 7 November 2006 repeat several citations. Although, the references listed in the 29 November 2005 IDS have been lined through, these references have been indicated as being considered in the 7 November 2006 IDS.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Objections

3. Claim 13 is objected to because of the following informalities: it appears that "wherein perovskite crystals belong to an orthorhombic system" should be "wherein the perovskite crystals belong to an orthorhombic system". Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-4, 6-10, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. (US 6093339) in view of Kennedy et al. (US 2003/0199228).

6. With respect to claim 1, Kimura et al. discloses a piezoelectric ceramic composition characterized by containing: metallic element K; metallic element Na; metallic element Nb (column 3, lines 13-22); M1, which represents a divalent metallic element, or a metallic element combination formally equivalent to a divalent metallic element (column 3, lines 13-26); M2, which represents a tetravalent metallic element, or a metallic element combination formally equivalent to a tetravalent metallic element (column 3, lines 13-26); non-metallic element O, wherein K, Na, Nb, M1, and M2 constitute the formula $[(1/2)aK_2O - (1/2)bNa_2O - cM1O - (1/2)dNb_2O_5 - eM2O_2]$, a, b, c, d, and e in the formula satisfy the following relations: $0 < a < 0.5$, $0 < b \leq 0.25$, $0 < c < 0.11$, $0.4 < d < 0.56$, $0 < e < 0.12$, $0.4 < a + b + c \leq 0.5$, and $a + b + c + d + e = 1$ (column 3, lines 13-22). The relationships between a, y, z, m, and n of Kimura et al. and a, b, c, d, and e, of the claims is as follows: $a = (1/2)(1-n)(m)(1-(x+y))$, $b = (1/2)(1-n)(m)(x)$, $c = (1/2)(n)$, $d = (1/2)(1-n)(1-z)$, and $e = (1/2)(n)$.

Kimura et al. does not disclose expressly that the ceramic composition contains M3, which represents a metallic element of a sintering aid component and which is at least one of Fe, Co, Ni, Mg, Zn, and Cu, or that when the total amount of K, Na, Nb, M1, and M2 as reduced to corresponding oxides is 100 parts by mass, the amount of M3 as reduced to M3 oxide is 5 parts by mass or less.

Kennedy et al. teaches a piezoelectric ceramic composition that includes M3, which represents a metallic element of a sintering aid component and which is at least one of Fe, Co, Ni, Mg, Zn, and Cu, or that when the total amount of K, Na, Nb, M1, and M2 as reduced to corresponding oxides is 100 parts by mass, the amount of M3 as reduced to M3 oxide is 5 parts by mass or less (Paragraph 55).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the sintering aid, M3, of Kennedy et al. with the ceramic composition of Kimura et al. for the benefit of creating a ceramic composition that can be sintered more easily (Paragraph 55 of Kennedy et al.).

7. With respect to claim 2, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kennedy et al. discloses that when the total amount of K, Na, Nb, M1, and M2 as reduced to corresponding oxides is 100 parts by mass, the amount of M3 as reduced to M3 oxide is 0.1 parts by mass or less (Paragraph 55).

8. With respect to claim 3, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al.

Art Unit: 2834

discloses that M1 is at least one of Ca, Sr, Ba, $(\text{Bi}_{0.5}\text{Na}_{0.5})$, and $(\text{Bi}_{0.5}\text{K}_{0.5})$ (column 3, lines 23-26).

9. With respect to claim 4, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that M2 is at least one of Ti, Zr, and Sn (column 3, lines 23-26).

10. With respect to claim 6, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kennedy et al. discloses that M3 is a combination of Cu and at least one of Fe, Co, Ni, Mg, and Zn (Paragraph 55).

11. With respect to claim 7, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that a, b, and d in the formula satisfy the following relation $(a + b)/d \leq 1.00$ (column 3, lines 13-22).

12. With respect to claim 8, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that a, b, and c in the formula satisfy the following relation: $0 < c/(a + b + c) \leq 0.20$ (column 3, lines 13-22).

13. With respect to claim 9, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that in addition to K, Na, Nb, M1, M2, and M3, metallic element Li, wherein at least one of K and Na in the formula is partially substituted by Li (column 3, lines 13-26).

14. With respect to claim 10, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that in addition to K, Na, Nb, M1, M2, and M3, metallic element Ta, wherein Nb in the formula is partially substituted by Ta (column 3, lines 13-26).

15. With respect to claim 12, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al. discloses that the piezoelectric composition has a perovskite crystal structure. While Kimura et al. does not explicitly state that the composition has a perovskite structure, this is merely an inherent property of the material. As Kimura et al. discloses the claimed composition, that composition would have the same material properties as the claimed composition.

16. With respect to claim 13, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 12. Kimura et al. discloses that the perovskite crystals belong to an orthorhombic system. While Kimura et al. does not state explicitly that the crystals of the composition belong to an orthorhombic system, this is merely an inherent property of the material. While there may be examples of perovskite materials that are not orthorhombic, the crystal structure remains an inherent material property. As Kimura et al. discloses the claimed composition, that composition would have the same material properties as the claimed composition.

17. With respect to claim 14, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1. Kimura et al.

discloses at least a pair of electrodes which are in contact with the piezoelectric member (column 4, lines 57-59).

18. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. in view of Kennedy et al. and Nishida et al. (US 2002/0066882).

19. With respect to claim 11, the combination of Kimura et al. and Kennedy et al. discloses a piezoelectric ceramic composition as described in claim 1.

Neither Kimura et al. nor Kennedy et al. discloses expressly that the composition contains, in addition to K, Na, Nb, M1, M2, and M3, metallic element Sb, wherein Nb in the formula is partially substituted by Bb.

Nishida et al. teaches a piezoelectric ceramic composition in which metallic element Sb partially substitutes for Nb (Paragraphs 7 and 8).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the Sb of Nishida et al. with the piezoelectric ceramic composition of Kimura et al. as modified by Kennedy et al. as Sb is a well-known functional alternative to Nb, and Ta (Paragraph 8 of Nishida et al.).

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Suzuki (US 6278138) discloses a broad range of piezoelectric ceramic compositions (column 9, lines 19-30), and also teaches that materials such as those in Kimura et al. have perovskite crystal structures. Furukawa et al. (US 2003/0134738) discloses that orthorhombic structures are among the common

structures taken by perovskite materials, and that the constituent materials of Kimura et al. are of an orthorhombic structure (Paragraph 41).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is (571)272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Derek J Rosenau
Examiner
Art Unit 2834

/D. J. R./
Examiner, Art Unit 2834

Application/Control Number: 10/558,383

Page 9

Art Unit: 2834

/Darren Schuberg/

Supervisory Patent Examiner, Art Unit 2834